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# The Philippine export portfolio in the product space: potentials, possibilities and policy challenges

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## Abstract

Using the product space and the index for product level sophistication, the performance of the Philippines' export basket is analyzed. Results indicate that while currently it has limited options for diversification, the country can still produce sophisticated exports given significant transformation of its production structure. Specific exports that have the potential to evolve into sophisticated rich-country goods are also identified.

# 1. Introduction

While the literature on export-led growth uses econometric techniques such as those in Crespo and Worz (2005) and Abual-Foul (2004), recent development in the field introduces a new technique for assessing the performance of a country's existing export portfolio through their location in the product space. The product space, developed by Hidalgo *et al.* (2007), is built on the concept that products close to each other have similar production requirements. It is essentially a visual representation of how goods are going to be related where the periphery is the region that has less connection to other products while the core is the region where products are more connected to other equally or more sophisticated goods. Hidalgo and Hausmann (2009), Hidalgo *et al.* (2009, 2007), Hausmann and Klinger (2008, 2006) and Hausmann *et al.* (2007) have argued that the location of a country's export basket in the product space conditions the trajectory of the country's economic development. If the country's export portfolio is in the sparse region, then the country has limited options for diversification and an even limited opportunity to penetrate the denser or richer part of the product space. Within this context, the government has a role to make the economy converge to the industrialized nations. In particular, it needs to ensure that horizontal and vertical integrations will happen through transformations in the country's production structure. Hidalgo (2009) also advocates the government's role in catalyzing market activities and in solving market coordination problems.

Using the product space as the main tool of analysis, this research work aims to assess the performance of the Philippine export basket and to identify specific exports that have the potential to evolve into sophisticated rich-country goods. This exercise will help evaluate the fruits of the country's structural transformation efforts and will help examine its options to fully benefit from a trade-led growth.

A detailed study along these lines is essential for the Philippines since it is a country that has a long history of industrialization efforts but still has to achieve the state of a fully industrialized economy. While its failure can be attributed to a host of factors, the general theme in which the failure is discussed typically revolves around the government's pursuit of ineffective industrial policies. For example, the import-substitution strategy in the 1950s did not materialize because the firms remained to be import dependent as the strategy failed to backward linkage. This is due to a domestic market that remained small as a result of the lackluster redistributive efforts (Lim and Bautista, 2002). The Philippines has instituted a series of agrarian reform programs but the benefits from it have yet to translate to those enjoyed by South Korea who has implemented land redistribution in the 1940s. This effort has paved the way to new breed of capitalists in the now industrialized South Korean economy.

Tecson (1992) has also argued that the nature of the export promotion incentives also helps the industrialization process. By choosing iron and steel industry as recipients of various incentives, Japan is able to help the industry to achieve international competitiveness (Tecson, 1984). This strategy worked for South Korea as well. While this is essentially a 'picking winners' strategy, the current research is motivated to identify some of the Philippine exports that can serve as a starting point for industry-specific government intervention. General policies to reap the benefits of a trade-led growth are emphasized as well.

The paper is organized as follows: section 2 discusses the tools for analysis by providing a brief review of literature. Section 3 discusses the potentials and challenges faced by the Philippine export portfolio and section 4 provides the summary and conclusion.

## 2. Tools for Analysis

The tools for analysis will be the product space, which is a relatively new method to assess the performance of a country's existing portfolio and its implication to a trade-led economic growth. The product space builds upon the context of cost discovery process (Hausmann and Rodrik, 2003) where externalities, in the form of successful product creation, drive other marker players to replicate and innovate. Based on this, Hausmann *et al*. (2007) have developed the product level sophistication index. This is given by

$$PRODY_k = \sum_j \frac{x_{j,k}/X_j}{\sum(x_{j,k}/X_j)} * GDP\, per\, capita \quad \text{where} \quad X_j = \sum_k x_{j,k} \text{ and } x_{j,k} \text{ is the export}$$

value of product *k* in country *j*. *PRODY* is interpreted as the weighted average of per capita *GDP* by observing that the numerator of the weight is just the export share of the commodity in the country's overall export basket and the denominator is just the aggregate of the export shares across all countries exporting the good. Each product will have a *PRODY* that represents the product's productivity. Hausmann *et al*. (2005) disclose that manufactured goods have higher *PRODY* relative to primary commodities.

Building on these, Hausmann and Klinger (2006) have developed a proximity measure given by $\phi_{ij} = \min\{P(RCAx_i \mid RCAx_j), P(RCAx_j \mid RCAx_i)\}$[1]. The idea behind this formulation is that a country can easily produce other goods with requirements similar to the goods that are currently being produced.[2] The higher the values of the proximity measure, the closer the products *ij* are to each other and the less modification in the production structure is required.

Hidalgo *et al*. (2007) have used this proximity measure to create a product space to visually illustrate the relatedness of the goods. The product space has dense and sparse parts. The dense part, or the region with many connections, has products with high *PRODY*. Products in the dense regions include machinery and capital intensive goods. The sparse part has products with few linkages and with low *PRODY*. Products in the sparse region include petroleum, raw materials, garments and tropical agriculture.

One virtue of the product space is that it is an outcomes-based approach and it does not make any prior assumption on how goods are going to be related. This is different from Leamer (1984) where goods are assumed to be related based on factor intensity. The product space provides a large number of detailed information to assess the country's existing export

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[1] where RCA is computed as $RCA_{jk} = \dfrac{c_{jk}}{c_k}$ where $c_{jk} = \dfrac{X_{jk}}{\sum_k X_{jk}}$ is the ratio between the country *j*'s export

of good *k* and its total export and $c_k = \dfrac{\sum_j X_{jk}}{\sum_{jk} X_{jk}}$ is the ratio between the world's export of good *k* and the total

world export.

[2] Leamer (1984) is also an example of proximity measure.

portfolio. It provides direction on future product diversification and is therefore useful in a country's efforts towards structural transformation.

### 3. The Philippine Export Portfolio: Potentials and Challenges

This section aims to assess the performance of the existing Philippine export basket and to provide insights whether the country can produce goods with high value-added in the future. To attain this objective, the proximity matrix is borrowed from Hidalgo *et al*. (2007) which is merged with the four-digit exports of the Philippines and some comparators using the United Nations Commodity Trade and Statistics Standard Trade and Industrial Classification Revision 2. The following notation will be used: $i$ for the country's 2006 exports and $j$ for the products close to $i$. In addition, the following selection criteria for product $j$ is also used: it should have $PRODY_j > PRODY_i$ and $share_j < .09\%$ . Export $i$ should have $RCA_i \geq 1$. Proximity criterion will be $\phi_{ij} \geq 0.55$ or $\phi_{ij} \geq 0.60$. This set of criteria means that we are looking for more sophisticated, hardly produced but proximate products to exports for which the country currently has a comparative advantage.

**Table I: Number of 2006 Exports with close products at $\phi_{ij} \geq 0.55$ and $\phi_{ij} \geq 0.60$**

| Country | A<br>Number of 2006 Exports with Proximate Products at $\phi_{ij} \geq 0.55$ | B<br>Average PRODY of Commodities in A | C<br>Number of 2006 Exports with Proximate Products at $\phi_{ij} \geq 0.60$ | D<br>Average PRODY of Commodities in C |
|---|---|---|---|---|
| China | 54 | 7773 | 19 | 8056 |
| Korea | 22 | 11928 | 16 | 12977 |
| Singapore | 22 | 11830 | 8 | 12723 |
| Philippines | 28 | 5146 | 15 | 4157 |
| Indonesia | 35 | 5951 | 15 | 5682 |
| Malaysia | 24 | 9535 | 10 | 7794 |
| Thailand | 43 | 8523 | 20 | 7735 |

Table I shows the number of 2006 exports with $RCA > 1$ in 2006 at proximities $\phi_{ij} \geq 0.55$ and $\phi_{ij} \geq 0.6$. Products $j$ satisfy the criteria set above. Information on this table allows us to assess the Philippine export portfolio relative to its Asian neighbors. Column A shows that while the Philippines has a number of existing exports with linkages to higher value-added products at $\phi_{ij} \geq 0.55$, column B indicates that the Philippine current export basket has the lowest average $PRODY$. For $\phi_{ij} \geq 0.6$, results in column D indicate that industrialized economies, like Singapore and Korea, still maintained their high average $PRODY$ while the rest of the ASEAN economies have become lower. Column C shows that Singapore only has a handful of 2006 exports but their average sophistication index is still high. The Philippines, on the other hand, has similar number of exports as Korea but the average sophistication level of the Philippine exports is the lowest among the countries considered. These results suggest that the current export portfolio for which the Philippines has comparative advantage on are still in the sparse region. This poses serious questions in the country's diversification capabilities and significant challenges in its production structure. This point is also illustrated in Hidalgo (2009). Korea, Singapore, China, Brazil, Indonesia

and Turkey have transformed their production structures during the same period but Brazil, Indonesia and Turkey have started from less sophisticated foundations (Hidalgo, 2009). Owing to this, the level of product complexity in these economies is deficient relative to the product sophistication of the now industrialized Asian nations. This supports the argument put forward by Hausmann and colleagues that goods do not have the same economic content and the initial location of goods in the product space helps define economic growth.

Given the initial conditions surrounding the Philippine export portfolio, will the country's exports evolve into highly sophisticated goods? Will the Philippines be able to penetrate the core region of the product space? Using $\phi_{ij} \geq 0.55$ for all rounds, table II lists the path from the 2006 Philippine exports (product *i*) with $RCA > 1$ that leads to potential exports (product *j*) with $PRODY \geq 25000$. In round one, we look for products *j* that satisfy the selection criteria set above that are close to products *i* at $\phi_{ij} \geq 0.55$. The second round contains the nearby products to the first round products and so on until the search leads to $PRODY \geq 25000$.

From table II, there are two products *i* that have the potential to take the country to the core of the product space. The "*other parts and accessories for vehicle*" can lead the country to the high-$PRODY$ products between rounds three to five. After round two, it has three productive paths. It is clear, however, that the country needs to upgrade its production structure at the very first round. This suggests that the government and the firms should work together to modify the country's production structure to accommodate the requirements of "*refractory goods*". Once this is done, the next round of production adjustments should be accomplished to accommodate the production of "*cocks, valves and similar appliances*". Another round of adjustment will enable the country to produce "*furnace burners and mechanical stokers*", which is at the very core of the product space.[3]

"*Parts of boilers and auxiliary plant*" has more paths leading to potential sophisticated exports. It requires lesser modification on the country's production structure ($\phi_{ij} \geq 0.68$) at the first round although it reaches the core product only after round six. This export can also lead to other product ("*nonmechanical or electrical instruments for physical analysis*") other than the good with the highest $PRODY$.

The country's ability not just to diversify but to branch out into more sophisticated products is important to fully harness the benefits of a trade-led economic growth. While the existing location of the Philippine exports allows a smaller base for diversification into more sophisticated exports, the results above suggest that the country's exports can evolve to high value-added products in the long-run. However, this is only possible provided that the Philippines adjusts its current production structure. The evolution of goods does not naturally happen and can only take place when firms are not limited in its vertical and horizontal integration efforts. Therefore, the government's role is to ensure that firms will be able to capture the externalities of the successful production of goods from industrialized economies through replication and innovation. Korea and Singapore's experience will tell us that their efforts to backward and forward linkage have reaped substantial economic benefits. Currently, they have a big number of exports in the denser region of the product space and

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[3] Highest $PRODY_{world} = 28571$ is computed using all the exports of all countries based on the UN-COMTRADE SITC Reision 2, 4-digit Disaggregation.

are likely to reach the highest value-added product in a shorter time compared to their other Asian neighbors.

**Table II:  2006 Philippine Exports and the paths to potential exports with** $PRODY \geq 25000$

| 2006 Exports (product *i*) | Proximate products at various  rounds (product *j*) |
|---|---|
| Other parts and accessories, for vehicles **(13683)** | R1 Refractory gods **14776/0.58**<br>　R2 Cocks, valves and similar appliances, for pipes boiler shells, etc **(17122 / 0.58)**<br>　　R3 Furnace burners; mechanical stokers, etc, and parts thereof, nes **(28571/0.67)**<br><br>　　R3 Parts, nes of pumps and liquids elevators falling in heading 742 **(17192 / 0.58)**<br>　　　R4 Nonmechanical or electrical instruments for physical, etc, analysis **(22342 / 0.58)**<br>　　　R5 Hormones, natural, or reproduce by synthesis, in bulk **(27445 / 0.56)**<br><br>　　R3 Parts, nes of machines falling within headings 72631, 7264, 7267 **(19005 / 0.71)**<br>　　　R4 Furnace burners; mechanical stokers, etc, and parts thereof, nes **(28571 / 0.62)** |
| Partsof boilers and auxiliary plant of headings **(12430)** | R1 Sheets and plates, rolled, thickness 3mm TO 4,75mm iron/steel **(12995 / 0.62)**<br>　R2 Metallurgy and metal foundry equipment, and parts thereof, nes **(13813 / 0.58)**<br>　　R3 Metal forming machine-tool **(14068 / 0.61)**<br>　　　R4 Rolling mills, rolls therefor, and parts, nes of rolling mills **(14228 / 0.57)**<br>　　　　R5 Machine-tools for specialized industries; parts or accessories, nes **(16646 / 0.57)**<br>　　　　　R6 Cocks, valves and similar appliances, for pipes boiler shells, etc **(17121 / 0.55)**<br>　　　　　　R7 Parts, nes of pumps and liquids elevators falling in heading 742 **(17192 / 0.58)**<br>　　　　　　　R8 Nonmechanical or electrical instruments for physical, etc, analysis **(22342.71 / 0.58)**<br>　　　　　　　R9 Hormones, natural, or reproduce by synthesis, in bulk **(27445  / 0.56)**<br><br>　　　　　　R8 Other non-electrical machines and parts thereof, nes **(17645 / 0.62)**<br>　　　　　　　R9 Furnace burners; mechanical stokers, etc, and parts thereof, nes **(28571 / 0.60)**<br><br>　　　　　　　R9 Parts, nes of machines falling within headings 72631, 7264, 7267 **(19005 / 0.65)**<br>　　　　　　　　R10 Nonmechanical or electrical instruments for physical, etc, analysis **(27445 / 0.56)**<br>　　　　　　　　　R11 Hormones, natural, or reproduce by synthesis, in bulk **(27445 / 0.56)**<br><br>　　　　　　　R9 Other printing machinery; machines for uses ancilliary to printing **(18630 / 0.65)**<br>　　　　　　　　R10 Furnace burners; mechanical stokers, etc, and parts thereof, nes **( 27445 / 0.56)**<br><br>　　　　　R6 Welding, brazing, cutting, etc machines and appliances, parts, nes **(17285 / 0.57)**<br>　　　　　　R7 Parts, nes of the machines falling within heading 725 **(28571 / 0. 60)**<br>　　　　　　　R8 Nonmechanical or electrical instruments for physical, etc, analysis **(22342.71 / 0.58)**<br><br>　　R3 Interchangeable tools for hand or machine tools (tips, blades, etc) **(16350 / 0.60)**<br>　　　R4 Other non-electrical machines and parts thereof, nes **(17645 / 0.66)**<br>　　　　R5 Other printing machinery; machines for uses ancillary to printing **(18630 / 0.65)**<br>　　　　　R6 Nonmechanical or electrical instruments for physical, etc, analysis **(22343 / 0.65)**<br>　　　　　　R7 Hormones, natural, or reproduce by synthesis, in bulk **(27445 / 0.56)**<br><br>　　R4 Parts, nes of pumps and liquids elevators falling in heading 742 **(17192 / 0.62)**<br>　　　R5 Machinery, plant, laboratory equipment for heating and cooling, nes **(17497 / 0.62)**<br>　　　　R6 Other non-electrical machines and parts thereof, nes **(17645 / 0.57)**<br>　　　　　R7 Furnace burners; mechanical stokers, etc, and parts thereof, nes **(28571 / 0.60)**<br><br>　　R5 Parts, nes of machines falling within headings 72631, 7264, 7267 **(19005 / 0.71)**<br>　　　R6 Furnace burners; mechanical stokers, etc, and parts thereof, nes **(28571 / 0.62)** |

Note: PRODY and Proximity, separated by /, are in parentheses and in bold typeset. R followed by a number indicates the round.

Given these, the Philippine government has a role to make successful replication and innovation happen. Other than genuine land redistribution efforts, correct investments should be made in the appropriate technology, the nationwide infrastructure and the upgrade of research and development program. Stemming bureaucracy will provide a good climate to attract firms from other parts of the world to make physical and capital investment in the country. Skilled labor force is also a necessary ingredient for successful backward and forward linkages and the government should strengthen the link between the academe and the industry. There are huge numbers of students taking up courses in the medical profession who will either end up underemployed or as migrant workers. While the knowledge process

outsourcing (KPO) and business processing outsourcing (BPO) sector in the country have been performing well, these sectors are highly dependent on the economic growth of the outsourcing countries. The same arguments can also be said against the export sector but growth derived from trade in goods is more self-sustaining once the right mix of infrastructure, skills and knowledge-based structures are developed (Bayudan-Dacuycuy and Lim, 2011).

Although the composition of the Philippine exports has moved from primary commodities to electronics, some of these have high import-content. Long-run goals should include the ability to supply these parts for domestic production. In addition, the country should be able to move up the value chain production, where it is currently at the lowest chain of testing and assembly. Once again, these call not only for the correct investment climate but for the correct human capital formation as well.

## 4. Summary and Conclusions

Using the product space and the index for product level sophistication, results indicate that while the Philippine current export basket is still in the less-connected part of the product space, opportunities for diversification exist. There are paths from its existing export portfolio that may lead the country to a richer region of the product space. Such exports can provide the basis for enhancing specific industrial policies.

Since the evolution to sophisticated goods does not naturally happen, results imply that the government has to provide the necessary upgrade in its production structure to fuel economic advancement and subsequently, initiate convergence to the rich nations. It may be costly, may take some time and may require significant commitments from the government and various stakeholders. The benefits from growth may overwhelm the challenges to be hurdled, however.

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